MEASUREMENTS

GENERAL OR SPECIFIC?

H. O. DIETRICK, Superintendent
Kane, Pennsylvania

"That no boy or girl shall have less opportunity for education."

—Woodrow Wilson

An Answer

Within the past few years much theoretical knowledge on the work of measurement has been given to us, and many valuable tests have been prepared for use in testing the ability of pupils. Excellent as this theoretical knowledge is, it falls far short of bringing the desired efficiency unless we follow a plan as we do in training teachers—establish a close relationship between the theory and the practice. Measuring tests are of little value unless we are determined to do some intelligent "follow up" work. Standard tests and scales in school work may be either a great harm, or a great benefit, and this harm or benefit lies not in the tests or scales themselves, but in the use that is made of them and their results. Administering standard tests for the purpose of establishing a median is well nigh useless, other than that it establishes a certain goal toward which to strive. A test for this purpose may establish a generality—but fails to deal specifically. In other words it fails to deal with the individual pupil.

Simply because the median in addition for a certain grade may be high is no proof whatever that all the pupils in that grade know how to add with speed and accuracy. The main purpose of a standard test should be to discover certain strength or weakness on the part of the pupil. The only sane method is to "follow up" the individual need of each child—note his strength—weakness—determine upon corrective methods and administer them until correction comes. For this reason I shall give a few concrete instances of how a standard test may serve as a genuine benefit.

A few seventh grade pupils, who had made low scores in the Courtis Arithmetic Test, were selected, a "follow up" method employed and results noted. One of these pupils, whom we shall call X, made a score of 6 attempts and 4 rights. Another pupil, Y, made a score of 9 attempts and 6 rights. Still another pupil, D, made a score of 5 attempts and 3 rights. A series of problems, ranging from those that presented little difficulty to those that presented great difficulty, were administered in the form of a five minute daily drill for four weeks. Specific instructions were issued to both pupils and teachers so that the drills might be given under the same conditions. At the end of this period the Courtis Test was given the second time, with the following results, viz: pupil X made a score of 5 attempts and 3 rights; pupil Y made a score of 10 attempts and 6 rights; pupil D made a score of 6 attempts and 3 rights.

It was very evident at the end of this time that the drill failed to serve its purpose, and that some other means must be found to discover the shortcomings of the pupils. It also certified that a drill as a mere drill very often is a complete fizzle. A conference, with each pupil, was now arranged for in order to discover, if possible, the method of procedure followed by the pupil in arriving at his conclusions. The Studebaker Exercise No. 5 which required the

adding of columns of four figures each was administered to pupil X. Next an exercise requiring the adding of columns of six figures was given. Both these exercises showed that the pupil knew the combinations. A third exercise requiring the adding of columns of 10 figures each was given. Here was brought to light a distinct failing on the part of the pupil in that the score was, 18 attempts and 5 rights.

In order to arrive at the exact failing of the pupil, he was given an exercise and asked to add aloud, so that his mental process might be noted. It now became evident that the pupil had not formed the habit of carrying correctly. He tried to remember the number to be carried, added the entire column and then tried to recall the carrier. This caused confusion and very often would cause the pupil to add the column for the second time. The pupil was shown where he failed—corrective measures given, and at the end of another drill exercise, more difficult than either of the former drills, his score was 15 attempts and 13 rights. This pupil evidently did not need drill, but a correct procedure.

The next pupil Y, was now called for a conference to add aloud without any preliminary drills. This pupil would add, sometimes half of the column, sometimes three-fourths, then stop a few moments, after which he would want to begin all over again. Some times he would go down the column, but would stop before placing the result as though guessing. Here it is clearly seen that the pupil failed to bridge the attention span—and lacked concentration. The pupil was told to concentrate, a few lessons in concentration given, then told to add. An exercise of two column additions of 8 figures each was administered. The Courtis Test was now given and the resulting score was 10 attempts and 8 rights.

Pupil D was now called for a conference. After a few drill exercises the results showed a very low score both for speed and accuracy. This case proved very interesting in the requirement of adding aloud. Whenever he added the single number additions up to 10, as 8 and 6, 9 and 7, etc., he would invariably arrive at the correct result. However, when he added a column like this, viz: 9 plus 7 plus 9, he would go through this process; 9 and 7 are 16, 9 are 4 plus 5 and then add 16 plus 4 are 20 plus 5 are 25; or suppose he added 47 plus 9, he would say 47 plus 3 are 50 plus 6 are 56, dividing the figure 9 into 3 plus 6. This pupil evidently tried to add by 10's, that is, he would try to bring the first addition to some number of even tens.

I now tried this same pupil on subtraction. I asked him to subtract 9 from 26, and this is his process; 9 from 20 are 11, therefore 9 from 26 are 11 plus 6 or 17. In multiplication, when asked to multiply 3x15, he would say 3x10 are 30, 15 is 5 more than 10, and 3x5 are 15, therefore 3x15 equals 30 plus 15 or 45. In division when asked to divide 51 by 9, he would say 9 is less than 10, 51 is less than 6 tens, therefore the result is 6.

The corrective method here seemed to be complex, just as the process followed by the pupil seemed complex, but when told that in adding, 9 plus 7 plus 9, he must add 9 plus 7 are 16, and then add

the number to the right of this two figure number (16) to the following number 7, he at once brightened and said, "I never knew that before." After a few days of drills in which the adding was done by the teacher in concrete form, thus 9 plus 7 are 16; 16 plus 9 are 25 (16), the Courtis Tests were given and the resulting score

$$\frac{9}{25}$$

was 12 attempts and 10 rights, instead of 6 attempts and 5 rights as before.

Another pupil seemed able to add in spans of three only. When asked to add a column of figures like, 6 plus 2 plus 7 plus 4 plus 9 plus 3 plus 5, he would say, 6 plus 2 plus 7 are 15—4 plus 9 plus 3 are 16—16 and 15 are 31 plus 5 are 36. Whenever a three span was added, like 6 plus 2 plus 7 are 15, he would place the result 15 to the right of the last number added. After the entire column was added in three spans he would return and add the three span results to the right. In other words he would add by addition within addition, thus making the work longer and more complex than needed. We can readily see how such a method would bring, although not a low accuracy, essentially a low score in speed. This child was told to add a column of three figures, which he did, after which a column of four figures was given and he was asked to add the fourth figure to his immediate three span result without making another addition. Additional columns increasing in length were given, until the child finally saw how easy and rapid would be the result, after which he encountered no more difficulty.

Another child in subtraction would always do his subtracting outside of the problem, i. e. when asked to subtract 129 from 261, he would say 9 from 11 are 2, placing this little problem (11) to one

$$\frac{9}{2}$$

side subtracting and then placing the result under the real problem. His results usually were correct, but one can readily see the waste of time. A few problems under corrective methods and supervision soon placed this child in the right.

Another very interesting case comes to my mind where a child would always divide by 5's. For instance when asked to divide 35 by 7, he would reason in this manner, viz: 5 into 35 is contained 7 times, but 7 is 2 more than 5, therefore the result must be 7 less 2 or 5. By dividing 45 by 8 he would arrive at the result 6, in the same process of reasoning.

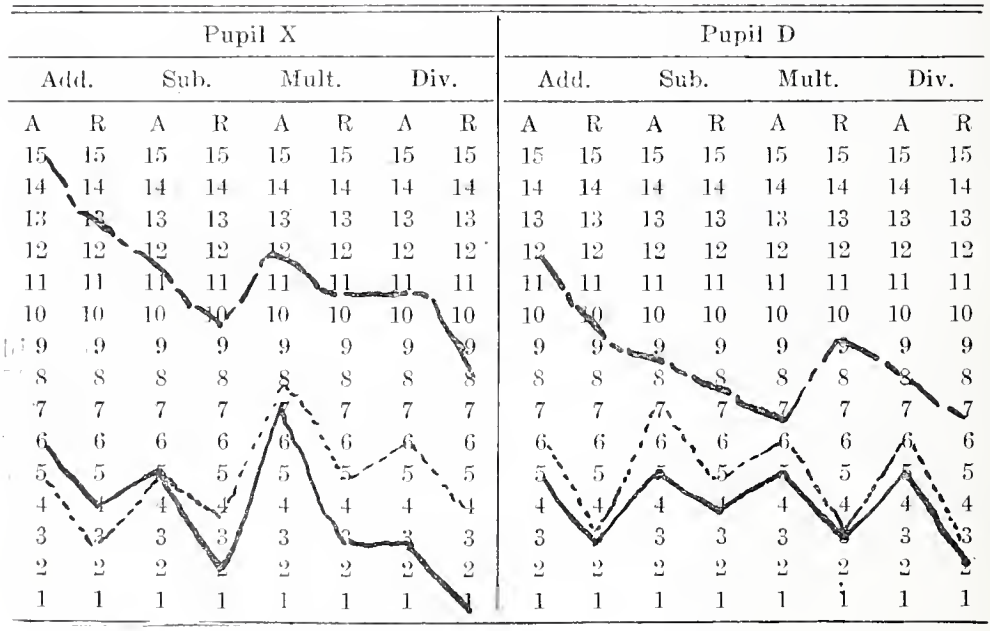
Undoubtedly there are thousands of cases similar to the ones I have mentioned, and many more could be enumerated, but time and space do not permit. I am fully convinced, however, unless "follow up" methods are used whenever and wherever standard tests are administered they had better not be given. The aim of these tests should be the aiding of the child in the discovery of his strength or his weakness—device methods whereby corrections may be made and thus the child benefited.

Certainly there can be very little satisfaction to a child, when told that his class attained an average or median of 18 attempts with

an accuracy of 90%. He may glory in the fact that they have attained so high a standard, but his glory is only that glory which goes before a fall, for when given a test whereby his individual ability is called upon he will soon realize that this ability may be at a low ebb. However, when a "follow up" method is used and corrective measures given he will soon see the benefit and his vain glory will change into a genuine pride.

In every day experience in numbers, one needs to be both rapid and accurate in the fundamentals of arithmetic. I believe I am safe in saying that all these examples which I have given were due to the fact that habituation was not formed in every one of these instances before the situation arose for this habituation to be used. Many may argue that the time for proper habituation is when the situation arises where it is needed, but as stated above habituation should be formed properly before the situation when it is to be used arises. All drill should have proper motivation. One of the reasons for a lack of proper motivation is the fact that in the presentation of all drills two very essential points are overlooked by the average teacher, viz: 1st. Attention given to helping children with special difficulties, and 2nd. Attention given to correction of errors.

For convenience and further to substantiate my claim that "drill does not necessarily produce efficiency, but corrective methods will," I am going to give two diagrams one each of pupil X and D.



——— Test I, given without drill.

- - - - - Test II, given after drill.

— - — Test III, given after "follow up."

Pupil X; Increase, of Test III over Test I, in scores 8. Increase in per cent. 32.

Pupil D; Increase, of Test III over Test I, in scores 5.5. Increase in per cent. 18.

A—Attempts. R—Rights.